

2006 RESEARCH PROBLEM STATEMENT

Problem Title: Seismic Vulnerability and Emergency Response of UDOT Lifelines

No.: 06-05-6

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1. Briefly describe the problem to be addressed:

Earthquakes pose a significant risk to UDOT's transportation infrastructure. This infrastructure is needed after a seismic event to provide emergency response, recovery and reconstruction functions. It is important that the transportation network perform these vital functions in a timely manner to reduce loss of life, property and commerce following a major earthquake.

This study proposes to focus on two key aspects: 1) seismic vulnerability of the transportation system and 2) emergency response. Risk assessment, traffic modeling and loss estimation techniques will be applied to the transportation network to determine vulnerability of the system and lifelines that most be protected, maintained or upgraded to perform emergency response and recovery functions. The results of vulnerability study will also be used to develop emergency response strategies/activities to aid in pre and post-event planning.

The study will first start in Salt Lake County and then later encompass the Urban Wasatch Front.

Strategic Goal: ☐ Preservation ☒ Operation ☐ Capacity ☒ Safety (Check all that apply)

2. List the research objective(s) to be accomplished:

1. Assess the seismic vulnerability of UDOT infrastructure using a systems approach.
2. Identify and prioritize UDOT's lifeline corridors and facilities using a risk based approach
3. Help UDOT develop a plan/program to protect/maintain/improve critical lifeline corridors
4. Help UDOT develop emergency response strategies/activities to enhance emergency response and recovery.

3. List the major tasks required to accomplish the research objective(s):

Estimated person-hours: 2000 to 3000

1. Apply the FHWA seismic risk assessment model to Salt Lake Valley to estimate potential earthquake damage resulting from earthquake strong motion, liquefaction, fault rupture, earthquake-induced landslides and mass movement.
2. Use UDOT traffic models to assess the disruption to the system from earthquake damage: including user and economic losses and delays results from the damage.
3. Determine the losses for a scenario earthquake (rupture of the Salt Lake City segment of the Wasatch fault) and other nearby events using risk assessment.
4. Identify key corridors and facilities that should be targeted from improvement, upgrade, or replacement.
5. Help UDOT develop emergency response activities that minimize the disruption and restore the system to a serviceable capacity and added these activities to the emergency response plan.

4. Outline the proposed schedule (when do you need this done, and how we will get there):

One year proposed schedule for completion of Salt Lake County

5. Indicate type of research and / or development project this is:

Large: ☒ Research Project ☐ Development Project
Small: ☐ Research Evaluation ☐ Experimental Feature ☐ New Product Evaluation ☐ Tech Transfer Initiative :
☐ Other _____

6. What type of entity is best suited to perform this project (University, Consultant, UDOT Staff, Other Agency, Other)?

University of Utah Civil and Environmental Dept. and the U of U Traffic Lab

7. What deliverable(s) would you like to receive at the end of the project? (e.g. useable technical product, design method, technique, training, workshops, report, manual of practice, policy, procedure, specification, standard, software, hardware, equipment, training tool, etc.)

1. Technical summary report
2. ARC GIS hazard assessment and traffic models
3. Implementation/Emergency Response plan for planning, traffic operations and safety.

8. Describe how this project will be implemented at UDOT.

1. Results of the study can be used for future planning and maintenance activities and funding of these activities
2. Traffic model can be used for other types of assessment (spills, floods, landslides, etc.)
3. Modifications/adaptations to UDOT's emergency response plan and activities

9. Describe how UDOT will benefit from the implementation of this project, and who the beneficiaries will be.

1. Reduction in seismic vulnerability and risk
2. A well-planned assessment and emergency response plan that includes realistic earthquake scenarios, damage and response to that damage.
3. Identification of key lifeline corridors and strategies to maintain, improve or upgrade these corridors.
4. A risk assessment/cost-benefit model that can be used for maintenance and planning purposes

10. Describe the expected risks, obstacles, and strategies to overcome these.

None. The proposed methods have already been developed by FHWA and the national center for earthquake engineering research. Traffic models have already been developed for the study area. This project will combine these models to develop the study and emergency response activities.

11. List the key UDOT Champion of this project (UDOT employee who will help Research Division steer and lead this project, and will spearhead the implementation of the results):

Richard Clarke, Division of Maintenance
Walter Steinvorth, Division of Planning
Shana Lindsey, Division of Research

12. Estimate the cost of this research study including implementation effort (use person-hours from No. 3): \$20k to \$30k

13. List other champions (UDOT and non-UDOT) who are interested in and willing to participate in the Technical Advisory Committee for this study:

Name	Organization/Division/Region	Phone
A) Bob Carey	DPE-DES	538-3784
B) Barry Welliever	Utah Seismic Safety Commission	barrywelliever2@earthlink.net
C) Gary Christenson	Utah Geologic Survey	537-3304

14. Identify other Utah agencies, regional or national agencies, or other groups that may have an interest in supporting this study:

MPC

(THE MPC WILL BRING MATCHING MONEY (DOLLAR PER DOLLAR) FOR THIS STUDY.)